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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/945,241	08/31/2001	Fumiaki Matsushima	9319I-000277	1301
27572	7590	03/31/2005	EXAMINER	
HARNESS, DICKEY & PIERCE, P.L.C.			NGUYEN, HA T	
P.O. BOX 828			ART UNIT	
BLOOMFIELD HILLS, MI 48303			PAPER NUMBER	

2812

DATE MAILED: 03/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/945,241

Applicant(s)

MATSUSHIMA ET AL

Examiner

Ha T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-15,17 and 30-49 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-15,17 and 30-49 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Notice to applicant***

1. In view of the availability of new Art, the allowability of claims 1, 3-15, 17, 30-49 has been withdrawn.

### ***Claim Objections***

2. Claims 5, 6, and 30-49 are objected to because of the following informalities: In claims 5, 6, 30, 31, lines 3, before "first" and "second", insertion of -a--, and in claims 40-41, lines 3, before "the", "first" and "second", insertion of -each of--, -a--, and -a--, respectively .

Appropriate correction is required.

Claims 32-49 and 42-49 variously depend from claims 30, 31, 40, or 41, they are objected to for the same reason.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 4 is rejected under 35 U.S.C. 102(b) as being anticipated by Hikari (JPN 09-017795).

Referring to Figs. 1-2(e) and related text, Hikari discloses a method of forming a bump comprising the steps of: (a) forming a resist layer 8 to have through-holes located over a pad 1; (b) forming metal posts 3 on the pad conforming to a shape of the through-holes and (c) removing the resist layer which shapes the metal posts after step (b) so as to form a space between the metal posts.

### ***Claim Rejections - 35 USC § 103***

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5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 1038 and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1, 5, 7, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh et al. ( EPN 766310A2, hereinafter "Saitoh ") in view of Yoshiaki et al. ( JPN 01-191451).

Referring to Figs. 1-8 and related text, Saitoh discloses [Claim 1] a method for forming a bump comprising the steps of: forming a resist layer 24 to have a through-holes located over a pad 22, the resist layer having an inner surface to define the through-hole, and forming metal posts 3a or 25 on the pad conforming to the shape of the through-holes; [Re claim 15] a method of fabricating a semiconductor device comprising the steps of: bonding a plurality of metal posts to a plurality of leads through a soldering or brazing material, each of the metal posts formed on each of a plurality of pads of a semiconductor chip, each of the metal posts having a first end formed adjacent the pad and a second end spaced apart from and opposite the first end.

But Saitoh does not disclose expressly the inner surface having a portion projecting inwardly in the through-hole, and the metal post having a side surface having a recess formed therein; the recess extending from the first end to the second end for receiving the soldering or brazing material, a wherein the soldering or brazing material, when melted, is allowed to flow into the recess of each of the metal posts for receiving the soldering or brazing material so as not

to spread onto an adjacent pad of the plurality of pads. However, the missing limitations are well known in the art because Yoshiaki discloses these features (See Figs. 1 and 2 ). A person of ordinary skill is motivated to modify Saitoh with Yoshiaki to obtain better reliability.

[Claim 5] Saitoh also discloses wherein the metal post comprises first and second metal posts, wherein the first metal post 3a is formed while the resist layer exists, and the second metal post 3b is formed on the first metal post (see Fig. 3); and

[Claim 7] wherein the pad is covered with an insulating film 30, the resist layer 24 is formed on the insulating film, an opening for exposing at least part of the pad is formed in the insulating film after forming the through-hole in the resist layer, and the first metal layer is formed on the pad while the resist layer exists (see Figs. 3-6).

Therefore, it would have been obvious to combined Saitoh with Yoshiaki to obtain the invention as specified in claims 1, 5, 7, and 15.

7. Claims 3, 6, 8, 17, 30-33, 41, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natsuya (JPN 07-066207), or Hikari or Saitoh in view of Yoshiaki, as applied above, (and further) in view of Dion (USPN 5130275).

Referring to Figs. 1-3, 6, and related text, Natsuya discloses [Re claim 3] a method of forming a bump comprising the steps of: forming a resist layer 33 to have a through-hole located over a pad, the through-hole having a ring shape so that part of the resist layer remains at a center of the through-hole; and forming a metal post on the pad conforming to a shape of the through-hole and the metal post has a hole exposing the pad; [Re claim 17] a method of fabricating a semiconductor device comprising the steps of: bonding a plurality of metal posts to a plurality of leads through a soldering or brazing material 34, each of the metal posts formed on one of a plurality of pads of a semiconductor chip and each of the metal posts having a hole exposing the pad, the hole penetrating each of the metal posts vertically from the pad without penetrating each of the metal posts horizontally to the pad, wherein the soldering or brazing material, when melted, is allowed to flow into the hole of each of the metal posts for receiving the soldering or brazing material so as not to spread onto an adjacent pad of the plurality of pads. But Natsuya fails to disclose expressly the metal post is not higher than the resist layer. However, the missing

limitations are well known in the art because Dion discloses these feature (see Fig. 8). An ordinary artisan is motivated to combine Natsuya with Dion to reduce processing steps.

[Re claim 30] Dion also discloses the metal post comprises first and second metal posts, wherein the first metal post 34 is formed while the resist layer exists, and the second metal post 44 is formed on the first metal post (see Fig. 8);

[Re claim 31] wherein the metal post comprises first and second metal posts, wherein the first metal post 34 is formed while the resist layer exists, and after removing the resist layer, the second metal post 44 is formed so as to cover a surface of the first metal post (see Figs. 9-11);

[Re claims 32 and 33] wherein the pad is covered with an insulating film 16, the resist layer 28 is formed on the insulating film, an opening for exposing at least part of the pad is formed in the insulating film after forming the through-hole in the resist layer, and the first metal layer is formed on the pad while the resist layer exists (see Figs. 8-11).

[Re claims 6, 8, 41, and 43] Hikari or the combined teaching of Saitoh and Yoshiaki discloses substantially the limitations of claims 6, 8, 41, and 43, as shown above. But it fails to expressly disclose forming the second post after the resist is removed. However Dion discloses this feature, as shown above.

Therefore, it would have been obvious to combine Natsuya or Hikari or Saitoh and Yoshiaki with Dion to obtain the invention as specified in claims 3, 6, 8, 17, 30-33, 41, and 43.

8. Claims 9-14, 34-40, 42, and 44-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hikari or the combination of Saitoh or Natsuya with their respective applied references, as applied above, and further in view of Watanabe et al. (USPN 6218281, hereinafter "Watanabe").

Hikari or each combination of the applied references discloses substantially the limitations of claims 9-14, 34-40, 42, and 44-49, as shown above. Dion also discloses [Re claim 40] the metal post comprises first and second metal posts, [Re claim 41] wherein the first metal post 34 is formed while the resist layer exists, and the second metal post 44 is formed on the first metal post (see Fig. 8); wherein the metal post comprises first and second metal posts, wherein the first metal post 34 is formed while the resist layer exists, and after removing the resist layer, the second metal post 44 is formed so as to cover a surface of the first metal post (see Figs. 9-

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11); [Re claims 42 and 43] wherein the pad is covered with an insulating film 16, the resist layer 28 is formed on the insulating film, an opening for exposing at least part of the pad is formed in the insulating film after forming the through-hole in the resist layer, and the first metal layer is formed on the pad while the resist layer exists (see Figs. 8-11).

But they fail to disclose expressly wherein the first and second metal posts are formed by electroless plating; wherein the first metal post is formed of a material containing nickel; and wherein the second metal post is formed of a material containing gold.

However, the missing limitations are well known in the art because Watanabe discloses these features (See Figs. 4A , 7B and col. 9, lines 22-51).

A person of ordinary skill is motivated to modify Hikari or each combination of the applied references with Watanabe to use electroless plating for reduction of production cost and to use Ni and Au as materials for the first and second metal layers to obtain better adhesion and better reliability.

Therefore, it would have been obvious to combine Hikari or each combination of the applied references with Watanabe to obtain the invention as specified in claims 9-14, 34-40, 42, and 44-49.

### ***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha T. Nguyen whose telephone number is (571) 272-1678. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week. The telephone number for Wednesday is (703) 560-0528.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt, can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Ha Nguyen  
Primary Examiner  
3- 22 - 05